

Available online @ www.iaraindia.com
 RESEARCH EXPLORER-A Blind Review & Refereed Quarterly International Journal
 ISSN: 2250-1940 (P) 2349-1647 (O)
 Impact Factor: 3.655(CIF), 2.78(IRJIF), 2.77(NAAS)
 Volume XI, Issue 37
 January - June 2023
 Formally UGC Approved Journal (63185), © Author

SHADOW PRICING - A MEASURE OF COST BENEFIT ANALYSIS

Dr. M. VIJAYALAKSHMI

Head & Assistant Professor, Department of Commerce (CS)

S. SANGEETHA

Assistant Professor, Department of Commerce (CS)
 Saradha Gangadharan College, Puducherry

Abstract

Shadow pricing of economic inputs and outputs is used in project analysis when some idealized assumptions of neoclassical economics are violated in the real world. Shadow prices can potentially serve as substitutes for distorted market prices in some cases, but not in others. This paper concentrates on project evaluation done in developing countries. It's needed to evaluate key economic resources in a few sectors or areas such as Imperfect market condition, wage rate, exchange rate, capital cost, inflationary pressures etc. Basically, it is used for framing public policies, for project evaluation and for programming purpose. Cost-benefit analysis (CBA) is used for project evaluation.

Keywords: Shadow pricing, Capital, Cost benefit, Equilibrium, Project evaluation.

Introduction

Shadow prices are prices indicating the intrinsic or true value of a factor or product in the sense of equilibrium prices. These prices may be different for different time periods as well as geographically separate areas and various occupations (in the case of labour). They may deviate from market prices. Shadow prices can potentially serve as substitutes for distorted market prices in some cases, but not in others.

Even though shadow costs have been utilized in government driven research, the utilization of shadow costs in the confidential area is turning out to be progressively more normal, as organizations attempt to assess the social effects of their choices. As the craving for

Natural, Social and Administration (ESG) contributing has developed so has the requirement for organizations and fiscal backers to assess the cultural effects of their creation and venture decisions. This pattern should be visible with the responsibilities made by most worldwide companies to decreasing their CO2 emanations and recognizing the effect their business exercises have on society.

Objectives of the Study

1. To bring out the meaning and the significance of shadow pricing
2. To display the merits and demerits of shadow pricing
3. To exhibit the uses of shadow pricing in cost benefit analysis

Positive Shadow Price

The graphs below show how shadow prices might interfere with resource allocation that is efficient. A

positive shadow price is seen in Figure 1 when the social marginal cost is lower than the private marginal cost. An illustration of this is immunisations; after obtaining one, you are less likely to spread contagious diseases, which benefit other members of society. The cost of making vaccines is known as the private marginal cost (PMC), but the net social benefit of receiving a vaccination is deducted from the PMC to determine the social marginal cost (SMC).

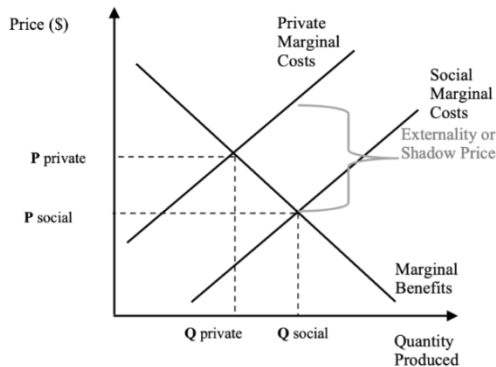


Figure 1: Positive shadow price

Negative Shadow Price

A negative shadow price is seen in Figure 2 when the social marginal cost exceeds the private marginal cost. Pollution is one instance of this; damaging toxic waste substances dumped into waterways have a detrimental influence on fish populations.

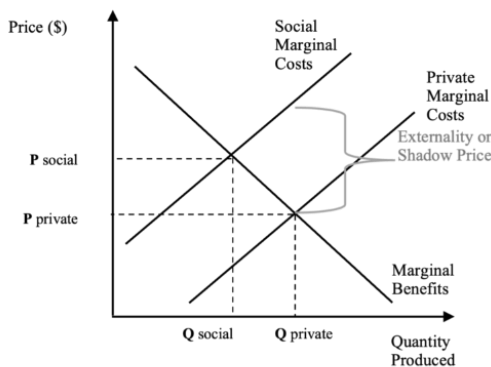


Figure 2: Negative shadow price

Need & Determination of Shadow Prices

In developing countries for project evaluation the distribution of factors on the basis of market prices is imperfect because there exist fundamental disequilibria which are reflected in mass underemployment at existing wage levels,

in the deficiency of funds at existing interest rates and in the scarcity of foreign exchange at the prevalent exchange rate. In such a situation, the equilibrium level of wages would be much below the market wage, the equilibrium interest rates would be higher than their market rates, and the equilibrium rate of exchange would be lower than its market rate. So the shadow prices are emphasized for the following reasons:

1. Imperfect Market Mechanism:

The price mechanism operates imperfectly in developing countries. Market prices do not correctly reflect relative scarcities, benefits, and costs due to the absence of perfect competition. Institutional factors distort the existence of equilibrium in the product, labour, capital and foreign exchange markets. Thus prices fail to reflect and transmit the direct and indirect influences on the supply side and the demand side.

All such difficulties are overcome with the help of shadow prices. Fiscal, monetary and other policies also help in bringing the market prices of products labour, capital and foreign exchange in conformity with their shadow prices and thus make investment projects a success.

2. Wage Rates:

In developing countries, there exist fundamental disequilibria in the labour market which are reflected in mass underemployment and unemployment at existing wage rates. In such economies, wages are much lower in the non-organised agricultural sector. Besides wages are much higher than the opportunity cost of labour in the industrial sector where labour is organised in strong trade unions. Therefore, unadjusted market wages of labour cannot be used for calculating the cost of such labour on investment projects because, the equilibrium level of wages would be much below the market wage in the rural sector.

At this point, Economists suggest that the shadow price of such labour can be fixed anywhere above the zero marginal

products of labour, and with the increase in the marginal product of labour, its shadow price can also be raised to the market level of wages.

3. Capital Costs:

In developing countries, there is a wide disparity between the prevailing interest rates in different regions and areas. In the capital market, the market rate of interest is much higher than the bank rate. Therefore, the equilibrium interest rate would be much higher than its market rate. If unadjusted market price of capital is used in calculating the cost of capital on investment projects, it would underestimate the real cost of such projects.

To overcome this problem, the shadow rate of interest can be estimated on the basis of interest rates paid by private investors. But while so doing, it is essential to allow for a social rate of discount for calculating the social benefits and costs of an investment project where its net present value (NPV) is calculated as $NPV = \sum_t B_t C_t / (1+i)_t$

Where B_t is the expected gross benefit of the project at time t , C_t is expected gross cost of the project at time t , and i is the social discount rate at time t . The social discount rate is the government's borrowing rate on long-term securities. So it differs from the market rate of interest. If the social discount rate is higher, short-period projects with higher net benefits are preferred, and if it is low, long-period projects with lower benefits are chosen.

4. Exchange Rate:

The acute scarcity of foreign exchange leads to balance of payments difficulties in developing countries. As a result, the current rate of foreign exchange is much lower than in the black market and the equilibrium exchange rate is lower than its market exchange rate.

To solve this problem, an artificial equilibrium is achieved in the balance of payments by fixing a higher shadow exchange rate than the official exchange

rate. For this, weight is attached to the cost of foreign exchanges in the project.

Suppose the shadow price of foreign exchange is 50% higher than its market value, the net effect of a project on the balance of payments should be given a weight of 0.5. This is equivalent to valuing foreign exchange costs and earnings at a price of 1.5. Tinbergen suggests the calculation of the shadow foreign exchange rate based on the 'black' and 'free' rates of exchange.

5. Inflationary Pressures:

Developing countries suffer from inflationary pressures because the market mechanism operates imperfectly due to a number of socio-economic and administrative obstacles.

So, actual market prices do not reflect social benefits and costs. Some prices are fixed by the government. Others are free, but are influenced by restrictive trade practices or monopolies. Still others are influenced by quantitative controls.

When prices rise, there is overvaluation of domestic currency. The prices of imported goods for projects underestimate their real cost. Thus there is need for shadow prices in the case of investment projects in different sectors of the economy.

A factor that is expected to be in short supply should have a shadow price higher than its market price, while a surplus factor should have a lower shadow price than its market price. Thus the shadow price is the price which would prevail if prices were equilibrium prices.

Limitations of Shadow Prices

1. Shadow price calculations require the availability of data. In contrast, accessible data are difficult to find in less developed nations.
2. Establishing intrinsic value requires full equilibrium in all markets, but underdeveloped economies lack this knowledge, making shadow prices corresponding to intrinsic values arbitrary.

3. Shadow prices are difficult to ascertain in underdeveloped countries due to the assumption of full employment equilibrium and the need for complete knowledge of demand and supply functions.
4. The static concept of shadow prices is problematic in project evaluation due to its timeless nature, as it values inputs and outputs at fixed shadow prices, which is unrealistic for long-term investment projects.
5. Shadow prices in the economy challenge private enterprises, which buy inputs and sell outputs at market prices, while the government uses them for project evaluation without monopoly.
6. Determining shadow prices in high capital-intensity projects is challenging due to the unique construction plans of the two projects, making it impossible to determine labour, capital, and foreign exchange inputs.

Uses of Shadow Prices:

Despite the above limitations, the shadow prices possess the following uses:

1. In Project Evaluation:

Shadow prices are a convenient tool for evaluating investment projects in different sectors of the economy. They are used for evaluating the effects of a project on the national income which are also known as external effects. This is done on the basis of costs-benefit analysis where both costs and benefits are calculated at shadow prices. Cost Benefit Analysis (CBA) is a traditional tool used to evaluate regional development project. The core of CBA is epitomized by economic analysis – evaluation and quantification of the effects on the society.

2. In Public Policy:

The success for development planning depends upon the correct operation of public policy. Shadow prices are intrinsic prices on whose correct determination depends the success of a plan to a considerable extent. In developing countries, investment projects in the public sector cannot be profitable

unless the prices of labour, capital and other inputs and foreign exchange rates are determined in shadow prices.

Though very often shadow prices are rough estimates, yet the state should try to bring market prices close to the shadow prices of products and factors through monetary, fiscal and other measures for the success of the plans.

3. In Programming:

Shadow prices have much importance in programming. In the context of developing countries, programming means the optimum use of investment whereby there is no difficulty in the production process. But, in reality, the difficulties of supplies of factors, rise in market prices and the scarcity of foreign exchange are found in such economies. All such problems are overcome with the help of shadow prices. The use of fiscal, monetary and other policies by the state help in bringing the market prices of products, factors and foreign exchange in conformity with their shadow prices and thus make investment programming a success. Thus shadow prices are a useful and important device for the success of project evaluation, public policy and investment programming.

4. In share market:

Investment in options is a high-yield, high-risk economic activity. Investing at high rates of return exposes investors to certain risks. Additionally, this risk is increased by the nature of options trading because high leverage is one of the key aspects of options investment. Investors should therefore investigate with great interest and urgency how to quantify initial capital, risk tolerance, and preset leverage, as well as how the distribution of input factors affects the expected return of their portfolios. Resources are scarce and contribute only marginally to the objective function, which is reflected in the shadow price. It serves as a crucial foundation for investors to realise a rational distribution of resources.

Shadow Pricing when Goods are in Fixed Supply

As indicated, to measure project costs, the LMST approach usually relies on converting the market prices of the inputs required by a project into their shadow prices. An exception occurs when the supply of an input is fixed (e.g., due to an import quota). If the fixed supply is binding, then a project will increase the market price of the input, thereby reducing the consumption of it by current consumers. Therefore, in this case, the opportunity cost of using the input in the project is the consumption forgone by consumers.

Shadow Price of Labour

Shadow prices of labour are of critical importance in conducting CBAs in developing countries. However, shadow-pricing labour raises some special issues. First, to determine the shadow price, one needs the market wage. This is often difficult to determine for unskilled workers. Second, different types of labour have different APRs. Specifically,

APR of type j labour = Shadow price of type j labour ÷ Market wage of type j labour

If the labor market for skilled workers is functioning well, then the actual wage is a reasonable approximation of the market wage and, therefore, the social opportunity cost of hiring workers for a project. If a conversion factor is available, the shadow wage can be obtained by multiplying the CF for skilled workers by the project wage. If a CF for skilled workers is unavailable, then one can use a sector specific CF or the SCF.

A special case occurs when a developing country must hire skilled workers from abroad:

- Typically, foreign workers would not be given standing.
- The shadow cost of hiring foreign workers depends on the fraction of earnings they send out of the country. Because earnings sent out of the

country result in a direct loss of foreign exchange, they have an APR of 1.

- In principle, the value of each item that workers from abroad purchase in the country should be multiplied by its APR, but this is usually impractical because the necessary information is unavailable. Thus, all earnings that remain in the country would be multiplied by the economy-wide CCF.
- Therefore, the shadow wage for foreign workers = $[h + (1-h)(CCF)]PW$, where h is the fraction of wages sent home and PW is the project wage.

Unskilled workers for a project in a developing country are ultimately drawn from the countryside. Even if a project is located in a city, workers in the country will be drawn to the city for employment. A model developed by John Harris and Michael Todaro suggests why this occurs. The model is based on two observations about developing countries:

- 1) Unemployment is very high in urban areas.
- 2) Earnings are typically higher in urban areas than in rural areas.

Given these observations, Harris and Todaro suggest that rural workers often migrate to cities to find work, even though some are not able to find jobs. They postulate that the probability that a rural worker will obtain a job upon migration to a city = $(L-U)/L = E/L$, where L is the size of workforce in city, U is the number unemployed, and $E = L-U$ is the number of employed workers. Therefore, the model implies there is an incentive to migrate from country to city as long as $RMW < UMW \cdot (E/L)$, where RMW is the rural market wage, UMW is the urban market wage, and $UMW \cdot (E/L)$ is the wage migrating workers expect to receive (on average). Consequently, according to the model, migration only stops when $RMW = UMW \cdot (E/L)$. At this point, however, urban wages will continue to exceed rural wages.

Conclusion

Market prices might not reveal the actual value of an item, product or service. So, in order to capture the actual value of the product or services in question, we might need to use shadow prices. Hence, it is crucial to point out that there are additional types of market distortions, such as tariffs, quotas, price supports, etc., that can make it challenging to choose the right shadow price to use in order to reflect the true value of the good or service on the market. A project that shows a profit at these shadow prices made a positive contribution to society's welfare. Even though shadow price has many limitations such as inadequate data availability, difficult to establish intrinsic value of a factor or product in under developed countries, static, timeless etc., it is used for evaluation of project, framing public policies, in programming etc.

References

1. "More than 100 multinational corporations have taken The Climate Pledge". *Climate Home News*. 2021-04-23. Retrieved 2022-05-04.
2. Färe, Rolf, and Kimberly D. Zieschang. "Determining Output Shadow Prices for a Cost-Constrained Technology." *Journal of Economics* 54, no. 2 (1991): 143–55. <http://www.jstor.org/stable/41794161>.
3. <https://uq.pressbooks.pub/socialcba/chapter/social-perspective-to-cba/>
4. <https://www.economicdiscussion.net/price/shadow-prices/shadow-prices-meaning-need-limitations-and-uses/18887>
5. <https://www.wallstreetmojo.com/shadow-pricing/>
6. Kell, Georg. "The Remarkable Rise Of ESG". *Forbes*. Retrieved 2022-05-04.
7. Paramasivan C & Anandaraman R (2012), *Micro Finance by Banks in India, Research Explorer, Vol I: Issue. 2 July - December 2012*
8. Peter g. Warr, "The Economics of shadow pricing: market distortions and public investment", *Staff Paper P74-22 October 1974, Department of Agricultural and Applied Economics and the Department of Economics, University of Minnesota*.
9. Pettinger, Tejvan. "Positive Externalities". *Economics Help*. Retrieved 2022-05-04.
10. Xu, F., Ma, J. "Intelligent option portfolio model with perspective of shadow price and risk-free profit." *FinancInnov* 9, 79 (2023). <https://doi.org/10.1186/s40854-023-00488-0>